Role and Development of Perceptual Skills in Medical Education

Halszka Jarodzka, Thomas Balslev, Kenneth Holmqvist, Marcus Nyström, Katharina Scheiter, Peter Gerjets, & Berit Eika

SWAET - 2010

Research Questions of this Project

1. Analyzing the **role** of perceptual skills on different expertise levels.

   → Expertise difference study with eye tracking and thinking aloud while diagnosing patient video cases.

   Balslev, T., Jarodzka, H., Holmqvist, K., de Grave, W., Muijtjens, A., Eika, B., Van Merriënboer, J. & Scherpbier, A. (in prep.). How do paediatricians diagnose? The influence of expertise on attention allocation and clinical reasoning

2. Developing and testing a method to **teach** perceptual skills.

   → Instructional design study with eye tracking and performance data on diagnosing patient video cases.

Perceptual Skills (cf. Chi, 2006; Manning et al., 2005)

1. **Visual search** of relevant elements	Which *body parts* are affected by the disease? Is the *face* diseased?
2. **Interpretation** of relevant elements	How do these body parts *move*? Level of *consciousness*? *Change* of movement after touching?
3. **Assignment** of observations to the according technical term	*Diagnosis* of a disease

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conceptual skills	3. **Assignment** of observations to the according technical term	*Diagnosis* of a disease

Conveying Perceptual Skills

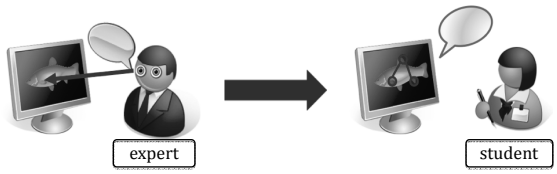
Many instructional material use expert knowledge to convey skills to learners.

Two prototypical instructional methods for initial skill acquisition are:

1. Worked examples
2. Cognitive modeling

Novel Instructional Approach

Eye Movement Modeling Examples

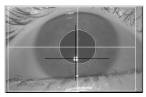


Dorr, M., Jarodzka, H., Barth, E. (2010). Space-variant spatio-temporal filtering of video for gaze visualization and perceptual learning. In Proceedings of Eye Tracking Research & Applications (ETRA), 2010.

Jarodzka, H., Scheiter, K., Gerjets, P., Van Gog, T., & Dorr, M. (2009). How to convey perceptual skills by displaying experts' gaze data. In N. A. Taatgen, & H. van Rijn (Eds.), *Proceedings of the 31st Annual Conference of the Cognitive Science Society* (pp. 2920-2925). Austin, TX: Cognitive Science Society.

Van Gog, T., Jarodzka, H., Scheiter, K., Gerjets, P., & Paas, F. (2009). Attention guidance during example study via the model's eye movements. *Computers in Human Behavior,* 25, 785- 791.

Research Questions



1. Does **EMME** **guide** the students' attention?
2. Does **EMME** lead to a more efficient **visual search**?

3. Does **EMME** lead to a better **interpretation** performance?

Design & Sample Size

N = 60 medical students in their final year

Eye movement modeling examples during **learning**

Control	Circle display	Spotlight display
		
n = 20	**n = 20**	**n = 20**

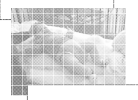
Learning Phase: Attention Guidance

Two single infants aged 3 weeks and 7 months;
prototypical cases of epilepsy

"Please take a look at the way the infant behaves."

3 Items

X



17-50 sec

Blank

Which body parts are affected by the disease?

How do these body parts move?

Do the movements change after touching the infant?

Is the face diseased?

What is the infant's level of consciousness?

Design & Sample Size

Marcus Nyström
Humanities Lab, Lund

N = 60 medical students in their final year

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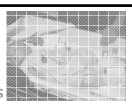
Testing Phase: Visual Search of Relevant Elements



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Blank

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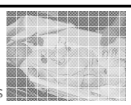
Testing Phase: Interpretation of Relevant Elements



2 Videos

Two single infants aged 3 weeks and 7 months;
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3 Items

X

17-50 sec

Blank

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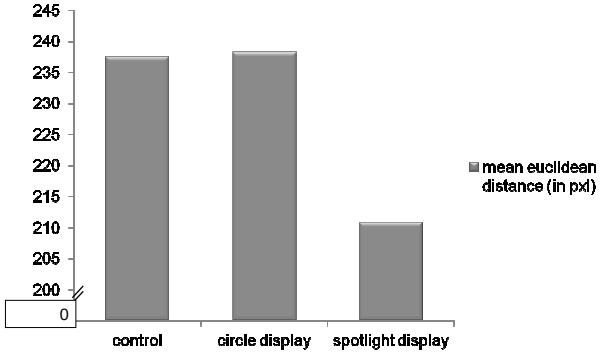
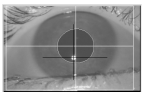
Results: Does EMME Guide the Student's Attention?



iwm kmrc

Research Questions



1. Does **EMME** **guide** the students' attention?

   Euclidean distance over time between model's and student's gaze points

2. Does **EMME** lead to a more efficient **visual search**?

3. Does **EMME** lead to a better **interpretation** performance?

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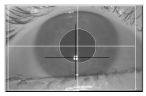
Research Questions



1. Does **EMME** **guide** the students' attention?

2. Does **EMME** lead to a more efficient **visual search**?

   Dwell time on relevant areas

3. Does **EMME** lead to a better **interpretation** performance?

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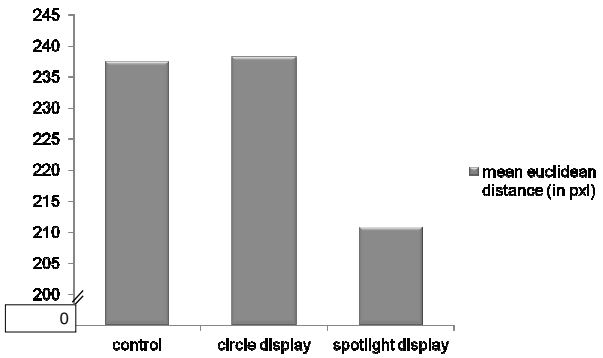
Results: Does EMME Guide the Student's Attention?



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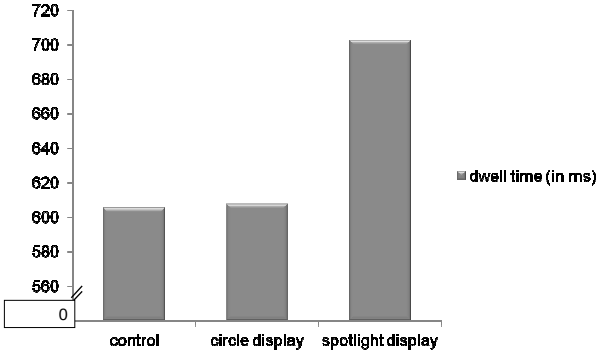
Results: Does EMME Lead to a More Efficient Visual Search?



Summary



1. Successful **attention guidance**:
   The Euclidean distance over time between the expert's and the student's gaze points is smaller for the spotlight display group compared to the other two groups.
2. More efficient **visual search**:
   Students, who learnt with the spotlight EMMEs had higher dwell times on relevant areas compared to the other two groups.
3. Better **Interpretation performance**:
   Students, who learnt with the spotlight EMMEs had higher correctness scores in the MCQs compared to the other two groups.

Research Questions

1. Does **EMME** **guide** the students' attention?
2. Does **EMME** lead to a more efficient **visual search**?

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   Multiple-choice questionnaire

iwm kmrc
Institut für Wissensmedien
Knowledge Media Research Center

Thank you for *your* attention!

h.jarodzka@iwm-kmrc.de

Results: Does EMME Lead to a Better Interpretation Performance?